7. Recommendations

The results of the analysis of benefits and cost, and other research data, strongly support the conclusion that an investment in a corporate approach to technology-supported learning is economically feasible. This conclusion and recommendation are consistent with the Departmental Strategic Alignment Implementation Plans that promote the development of a corporate approach to training, a reduction in travel, and the integration of information systems.

7.1 Multi-Technology Solution

The corporate approach to technology-supported learning that is modeled in alternative D is a synthesis of alternatives A, B, and C. This synthesis is a multi-technology solution that encompasses a mix of multimedia, interactive television, Internet, and traditional delivery methods. The acquisition of technology to support each delivery method would occur in parallel efforts according to each sites' priority needs and current disposition toward the technology.

Implementation of the Multi-Technology Solution involves the installation of approximately 25 satellite downlinks at key sites during the targeted 5-year period to accommodate over 90 percent of the DOE employees. In addition, approximately 150 multimedia-equipped learning centers would be established during the same period. While the corporate approach to technology-supported learning would be the primary driver for this technology acquisition, there are non-training applications that would benefit, such as the use of satellite equipment for multipoint meetings and conferences.

It is anticipated that during the 5-year period other information management and telecommunications initiatives, some functioning under partnering agreements with the corporate approach to technology-supported learning, will be drivers for upgrading individual workstations to include multimedia capabilities. Also, some DOE local and wide-area networks will be upgraded and fiber optic cable installed to increase speed and bandwidth. In such cases, the corporate approach to technology-supported learning could be a beneficiary of this technology acquisition.

The development and distribution of courseware for each delivery method would be determined by several factors including: the establishment of Departmental Centers of Excellence and lead sites, the establishment of internal and external partnering agreements, the availability of vendor products and services, and the experience of in-house learning activity developers. Prior to development or conversion to an advanced training technology, each cross-cutting learning activity would be evaluated by instructional designers using the Systematic Approach to Training (SAT) to determine the optimum delivery method or combination of methods.

One goal for the corporate approach to technology-supported learning is to deliver just-in time training to all Federal and contractor employees at their individual workstations. As advanced training technologies evolve and Departmental resources are upgraded, the incorporation of the advanced training delivery methods into one integrated method becomes a reasonable expectation.

7.2 Information Systems Support

It is anticipated that information systems personnel at each DOE site will support the move to advanced training technologies in much the same way as they currently support other technology acquisitions. This support includes procurement efforts (i.e., product/vendor research and acquisition) and system maintenance.

Various information systems support functions were identified during the business case development workshops. This support includes maintaining a central repository of all technology-supported learning activities and supporting online registration for those courses.

Before any new information systems are developed to support a corporate approach to technology-supported learning, the scope and impact of at least two DOE corporate information systems needs to be explored. One of the systems is the Clearinghouse for Training, Education, and Development (CTED). This Internet-based information system is sponsored by the Office of Training and Human Resource Development. The rapidly expanding DOE Universal Catalog is part of the CTED data base. Planned enhancements to CTED include an online scheduling and registration system and the ability to connect to all types of online training resources, such as secure testing, computer-based training, and printed materials. Many of the needs identified during the business case development workshops may be met through existing and planned CTED functions.

The other information system that will affect the corporate approach to technology-supported learning is the Corporate Human Resources Information System (CHRIS). CHRIS will be a Federal-employee human resource and training information management system. Although not planned in the initial system implementation targeted for March 1998, a training module is planned for future inclusion in CHRIS. Efforts to understand the relationship between the CTED and CHRIS are underway.

With a fully functional repository, it should be possible to increase enrollment in technology-supported learning courses by ensuring that all personnel throughout the Department can access information about those courses. Eventually, the use of a central repository should enable students to search for learning activities or courses, register, complete the activity (if it is Internet-based or can be downloaded), complete any online testing, and update their training record. The use of the repository will facilitate the identification and elimination of redundant courses and ensure that a proposed new learning activity or course does not already exist before acquisition, conversion, or development is undertaken.

7.3 Funding Considerations

Fully funding a corporate approach to technology-supported learning for education and training will require money for capital investments, operational costs, and courseware development or conversion. The primary components of capital investments are the computer equipment and related technology acquisitions. The operating expenses include some of the operational costs of

the equipment and technology and the analysis, design, development, implementation/delivery, and evaluation of courseware via advanced training technologies.

For the Multi-Technology Solution, which is recommended, the total budget (i.e., capital investments and operating expenses) involves approximately $36 million over the 5-year period. Total quantifiable benefits for the 5-year period exceed $102 million. The anticipated benefits, minus budget costs, indicates a $66 million net return on investment.

Table 7-1 shows the yearly breakdown of the budget into capital investments and operating expenses. Note: A 3.1 percent inflation rate has been added to the capital investments budget for each fiscal year.

Table 7-1. Five-Year Budget for the Multi-Technology Solution

Fiscal Year	Total Budget (in millions)	Capital Investments (in millions)	Operating Expenses (in millions)
1998	$ 6.6	$3.2	$ 3.4
1999	$ 6.2	$1.8	$ 4.4
2000	$ 7.3	$1.8	$ 5.5
2001	$ 7.6	$1.2	$ 6.4
2002	$ 8.3	$1.3	$ 7.0
Totals	$36.0	$9.3	$26.7

Funding issues will be addressed during the project planning phase of the corporate approach to technology-supported learning. Corporate management of financial resources will be required to support the corporate approach, including the acquisition of the information infrastructure (capital investments). If the DOE training budgets remain at current levels, some of the technology-supported learning operating expenses will be covered by money that is currently spent to develop and deliver training via traditional methods.

7.4 Project Plan

Project planning will identify the specific activities that need to be performed to achieve a fully functional corporate approach to technology-supported learning. Plans will address funding and human resource issues, the acquisition and distribution of technology (timing and quantity), the selection and development or conversion of specific courseware, and the achievement of organizational changes. It is recommended that a Departmental team, comprised of an appropriate mix of experts, be chartered to develop a project plan.

7.5 Implementation Plan

A full-scale implementation plan is needed to investigate and resolve site-specific and Departmentwide implementation issues that result from the project plan. It is recommended that Departmental teams comprised of an appropriate mix of experts be chartered to investigate and develop implementation plans for the following areas:

- Corporate Standards
  - Hardware platforms
  - Software
  - Networks/telecommunications
  - User interface (courseware compatibility)

- Centers of Excellence
  - Development of learning activities
  - Delivery of learning activities
  - Lead sites for technical qualifications

- Central repository of training and education data
  - Departmentwide repository of learning activity offerings (DOE Universal Catalog)
  - Registration and administrative functions (including automated record keeping)
  - Online availability of courseware

- Corporate Technology-Supported Learning Program
  - Corporate policy
  - Technology-Supported Learning Program Manager with Departmentwide oversight
  - Corporate management of resources (human, budget, funding)
  - Internal partnering agreements at each site with a Project Manager for Training and a Project Manager for Technology

7.6 Partnering Agreements

The establishment of internal and external partnering agreements to develop and deliver training and education learning activities is an important factor in the ultimate success of the corporate approach to technology-supported learning. Partnering agreements need to be explored in the following areas.

- Sharing technology and human resources, such as the use of studios and uplinks for ITV

- Developing and delivering courseware

- Providing a forum for sharing learning activities, techniques, and information on new technologies

- Showcasing DOE technology-supported learning capabilities as a model for agency activities

It is recommended that Departmental teams be chartered to expand existing, and pursue additional, partnering agreements in the following areas.

- Organizations within the DOE (including contractor organizations), such as the Office of Nonproliferation and National Security to use their studio at the Central Training Academy

- Other Federal and state government agencies, such as the Federal Aviation Administration to use their studio and uplink facilities

- Educational institutions, such as the National Technological University to receive graduate-level education learning activities

- Commercial vendors (for technology and courseware), such as Hewlett Packard for ITV technology and expertise

The potential for partnering opportunities has been confirmed by representatives of the Federal Aviation Administration, the Internal Revenue Service, and the Social Security Administration. Plans are underway to further explore these opportunities. The Defense agencies also offer significant opportunities for potential partnering.

7.7 Human Factors

Human factors play an important role in the acceptance and success of any program. They can be beneficial or present significant non-quantifiable risks. The DOE Technology-Supported Learning Business Case project team did not have an opportunity to investigate the impact of human factors on the acceptance of a Departmentwide Technology-Supported Learning Program. It is recommended that a Departmental team be chartered to identify and analyze the potential human factors that may impact a DOE Technology-Supported Learning Program, and to suggest ways to mitigate or manage risks. The following are three examples of human factors (benefit versus risk) that might be considered.

- Convenience of learning at desktop/workstation versus getting away from work environment and associated interruptions and distractions.

- Elimination of nonproductive travel time versus the risk that exists for people to avoid or indefinitely delay readily available training.

- Electronic delivery of training at the student's workstation versus the student's desire for tangible evidence of participation in the training session.

7.8 Performance Measures

Performance measures need to be developed to assess the yearly status and progress of the corporate approach to technology-supported learning. It is recommended that a Departmental team be chartered to select, implement, and collect performance measures. The following are some of the measures that would be considered for implementation.

- Reduction in travel expenses
- Avoidance of nonproductive time
- Reduction of learning activity development and delivery redundancies
- Course compression rates for each advanced training technology delivery method
- Student evaluations of learning activities delivered via advanced training technologies
- Schedule of technology acquisitions (planned versus actual)

7.9 Regular Review and Update of the Business Case

As advanced training technologies evolve and Departmental technology resources change, different technology-supported learning solutions may emerge as being more practical and appropriate for the DOE environment. To maintain accuracy and validity, the information contained in the initial business case will need to be reviewed on a regular basis (i.e., yearly) to assess progress; update the technology, infrastructure, and courseware data; recalculate the analysis of benefits and costs; and revise the out-year budgets. The recently chartered Training and Development Coordinating Group, which includes a Technology Applications Corporate Team, may be the natural successor to assume responsibility for the maintenance of the business case.